What is claimed is:

1. A hybrid fuel cell system comprising:

a fuel cell having an anode section and a cathode section;

a heat engine having a compressor cycle and an expansion cycle, said compressor cycle compressing oxidant supply gas;

a heat recovery unit responsive to exhaust gas from the cathode section of said fuel cell, said heat recovery unit supplying heat to said compressed oxidant supply gas;

the heated compressed oxidant supply gas being expanded in the expansion cycle of said heat engine to provide an expanded oxidant supply gas and produce mechanical energy for conversion to electrical energy in a generator;

a bypass assembly for segmenting said expanded oxidant supply gas into a first expanded oxidant supply gas portion and a second expanded oxidant supply gas portion; and

said first expanded oxidant supply gas portion being used to provide the oxidant supply gas input to the cathode section of said fuel cell and the second expanded oxidant supply gas portion being excluded from said fuel cell.

2. A hybrid fuel cell system in accordance with claim 1, wherein said bypass assembly includes a bypass line for coupling said second expanded oxidant supply gas portion to a line responsive to exhaust gas from said cathode section of said fuel cell.

3. A hybrid fuel cell system in accordance with claim 2, wherein said heat engine operates at a higher gas flow than the maximum gas flow required by said fuel cell cathode.

4. A hybrid fuel cell system in accordance with claim 3, wherein:

said heat engine comprises a turbine generator having a compressor section for receiving said oxidant supply gas and performing said compressor cycle and an expansion section for receiving said further heated compressed oxidant supply gas and performing said expansion cycle.

5. A hybrid fuel cell system in accordance with claim 4, wherein said fuel cell is a high temperature fuel cell.

6. A hybrid fuel cell system in accordance with claim 5, wherein said fuel cell is an internally reforming fuel cell.

7. A hybrid fuel cell system in accordance with claim 6, wherein said fuel cell is a carbonate fuel cell.

8. A hybrid fuel cell in accordance with claim 7, wherein said fuel is supplied at near ambient pressure.

9. A hybrid fuel cell system in accordance with claim 3, wherein said fuel cell is one of an externally reforming fuel cell and an internally reforming fuel cell.

10. A hybrid fuel cell system in accordance with claim 9, wherein said fuel cell is one of a carbonate fuel cell and a solid oxide fuel cell.

11. A hybrid fuel cell system in accordance with claim 2, wherein said bypass assembly further includes: a flow control valve having an input port for receiving said expanded oxidant supply gas from said expansion cycle of said heat engine and first and second output sections for delivering said first and second expanded oxidant gas portions, respectively; and a flow detector and control for detecting said first expanded oxidant gas portion and

controlling said flow control valve to adjust said first and second expanded oxidant gas portions.

12. A hybrid fuel cell system in accordance with claim 11, wherein said controlling of said flow control valve in such that the first expanded oxidant supply gas portion promotes optimal temperature distribution and oxygen concentration in said fuel cell.

13. A hybrid fuel cell system in accordance with claim 11, wherein said flow control valve is one of a three-way valve and a diverter valve.

14. A hybrid fuel cell system in accordance with claim 1, wherein:

said fuel cell is a carbonate fuel cell;

said heat recovery unit receives said exhaust gas from said cathode section of said fuel cell and the second expanded oxidant supply gas portion; and

said fuel cell system further comprises: a heat exchanger for supplying additional heat to said heated compressed oxidant supply gas from said heat recovery unit prior to the heated compressed oxidant supply gas being expanded in the expansion cycle of said heat engine to provide said expanded oxidant supply gas; and an oxidizer for receiving said first expanded oxidant supply gas portion and exhaust gas from said anode section of said fuel cell to develop an oxidizer output, said oxidizer output passing through said heat exchanger and serving as said oxidant supply gas input to the cathode section of said fuel cell.

15. A hybrid fuel cell system in accordance with claim 14, wherein said bypass assembly includes a bypass line for coupling said second expanded oxidant supply gas portion to a line responsive to exhaust gas from said cathode section of said fuel cell.

16. A hybrid fuel cell system in accordance with claim 15, wherein said heat engine operates at a higher gas flow than the maximum gas flow required by said fuel cell cathode.

17. A hybrid fuel cell system in accordance with claim 16, wherein:

said heat engine comprises a turbine generator having a compressor section for receiving said oxidant supply gas and performing said compressor cycle and an expansion section for receiving said heated compressed oxidant supply gas after passage through said heat exchanger and performing said expansion cycle.

18. A hybrid fuel cell system in accordance with claim 15, wherein said bypass assembly further includes: a flow control valve having an input port for receiving said expanded oxidant supply gas from said compressor section of said heat engine and first and second output sections for delivering said first and second expanded oxidant gas portions, respectively; and a flow detector and control for detecting said first expanded oxidant gas portion and controlling said flow control valve to adjust said first and second expanded oxidant gas portions.

19. A hybrid fuel cell system in accordance with claim 18, wherein said controlling of said flow control valve in such that the first expanded oxidant supply gas portion promotes optimal temperature distribution and oxygen concentration in said fuel cell.

20. A hybrid fuel cell system in accordance with claim 1, wherein:

said fuel cell is a solid oxide fuel cell;

said heat recovery unit receives said second expanded oxidant supply gas portion; and

said fuel cell system further comprises: an oxidizer for receiving exhaust gas from the cathode section of said fuel cell and for receiving exhaust gas from the anode section of said fuel cell to develop an output gas for said heat recovery unit.

21. A hybrid fuel cell system in accordance with claim 20, wherein said bypass assembly includes a bypass line for coupling said second expanded oxidant supply gas portion to a line responsive to exhaust gas from said cathode section of said fuel cell.

22. A hybrid fuel cell system in accordance with claim 21, wherein said heat engine operates at a higher gas flow than the maximum gas flow required by said fuel cell cathode.

23. A hybrid fuel cell system in accordance with claim 22, wherein:

said heat engine comprises a turbine generator having a compressor section for receiving said oxidant supply gas and performing said compressor cycle and an expansion section for receiving said heated compressed oxidant supply gas and performing said expansion cycle.

24. A hybrid fuel cell system in accordance with claim 21, wherein said bypass assembly further includes: a flow control valve having an input port for receiving said expanded oxidant supply gas from said expansion cycle of said heat engine and first and second output sections for delivering said first and second expanded oxidant gas portions, respectively; and a flow detector and control for detecting said first expanded oxidant gas portion and controlling said flow control valve to adjust said first and second expanded oxidant gas portions.

25. A hybrid fuel cell system in accordance with claim 22, wherein said controlling of said flow control valve in such that the first expanded oxidant supply gas portion promotes optimal temperature distribution and oxygen concentration in said fuel cell.